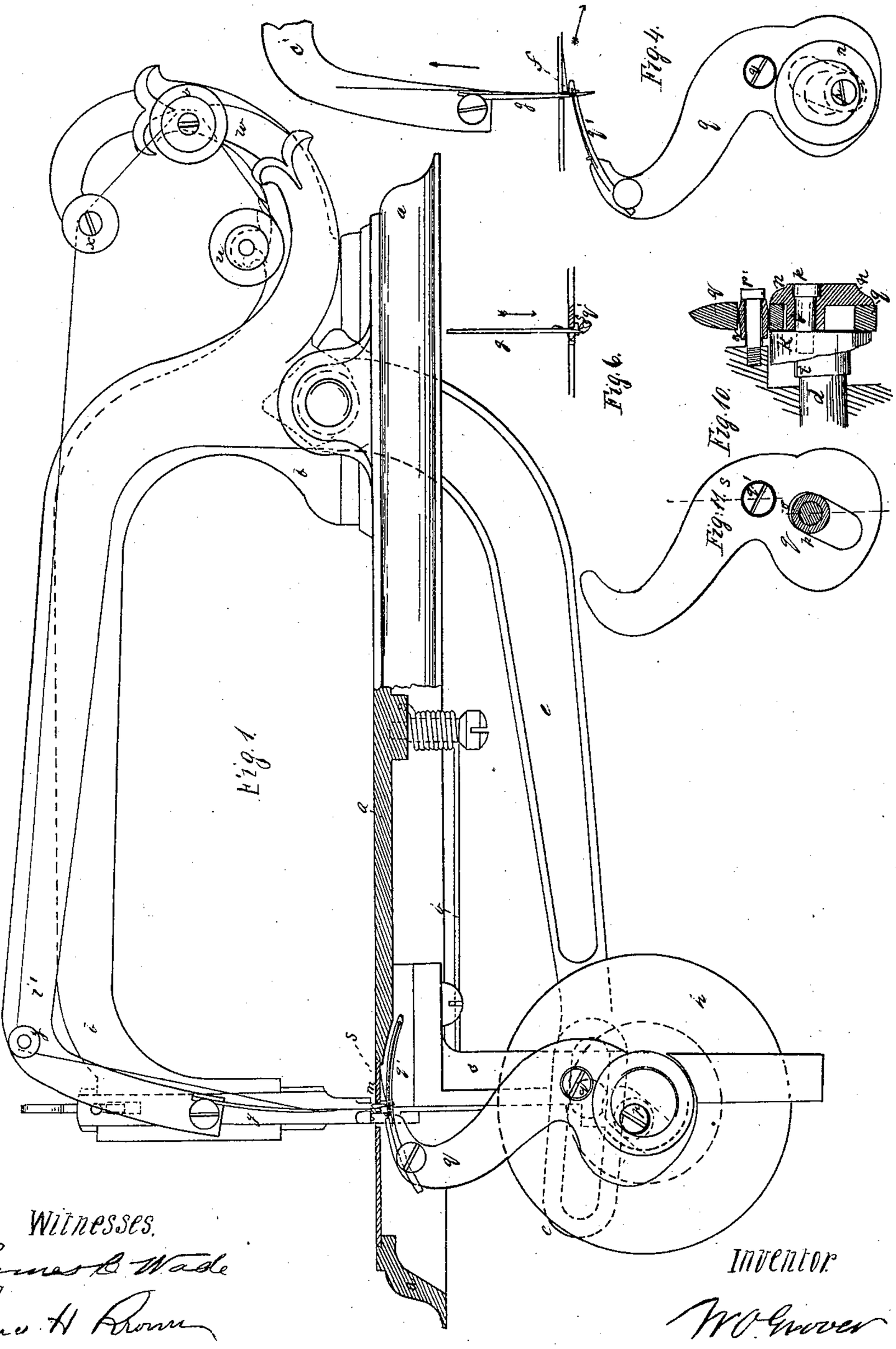
3 Sheets—Sheet 1.

W. O. GROVER.

SEWING MACHINE.

No. 36,405. Patented Sept. 9, 1862.



Witnesses.

James B. Wade

James H. Brown

Inventor.

W. O. Grover

3 Sheets—Sheet 2.

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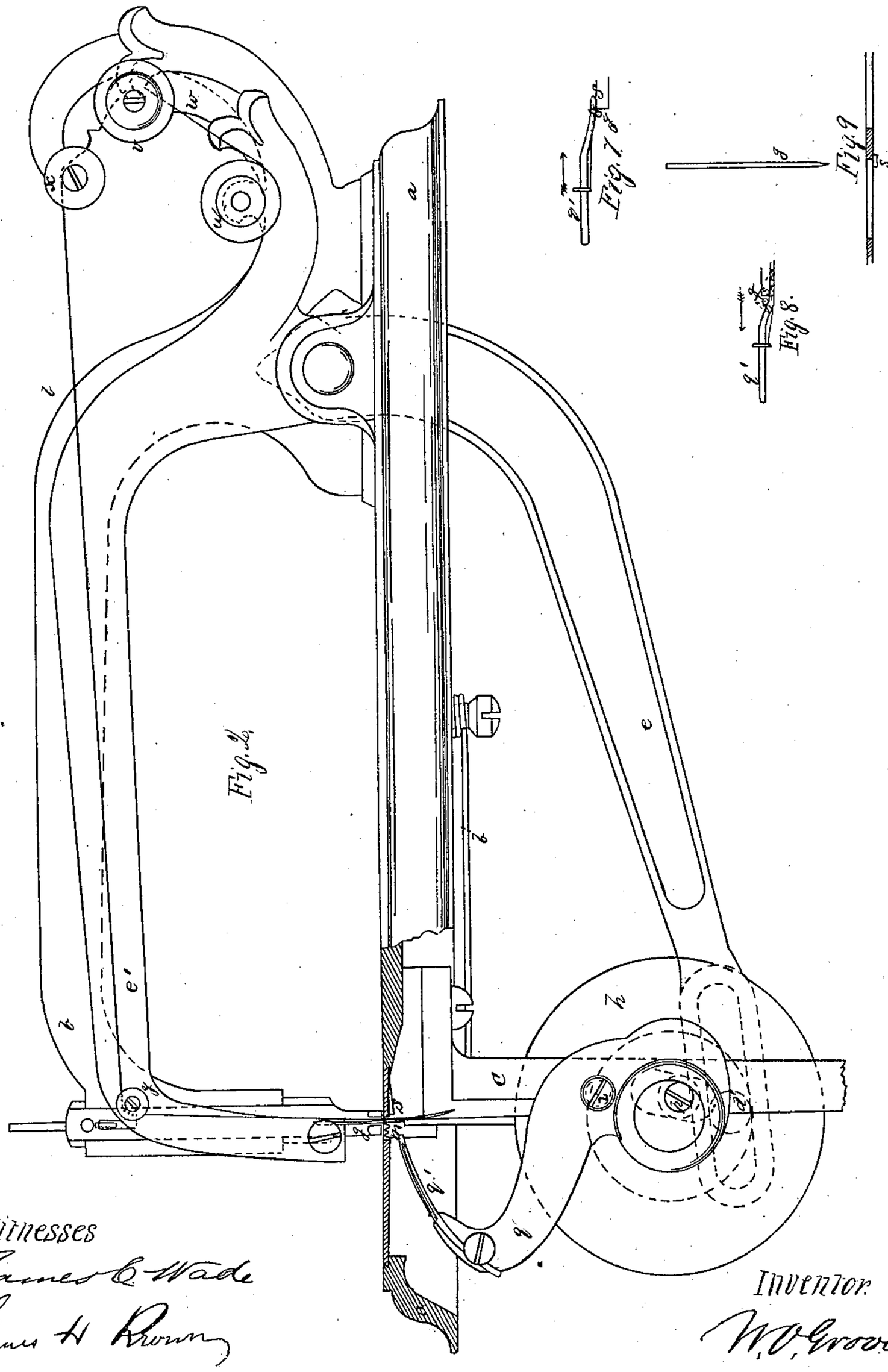

Witnesses

James E. Wade

James H. Brown

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3 Sheets—Sheet 3.

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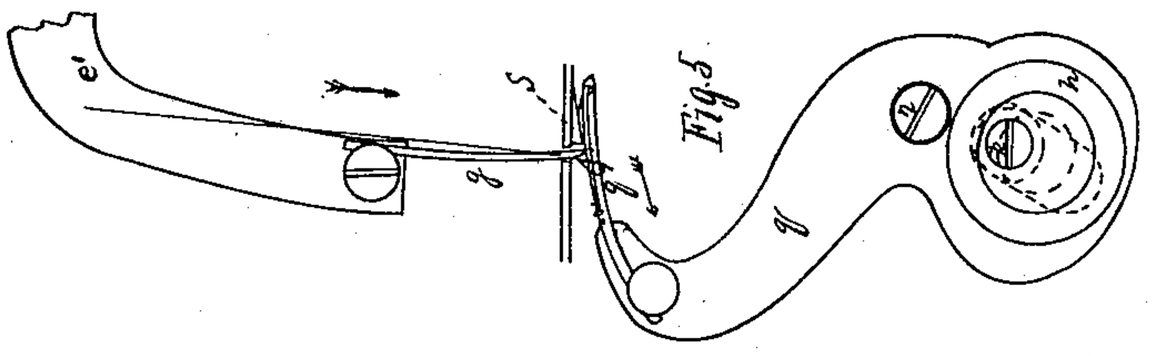

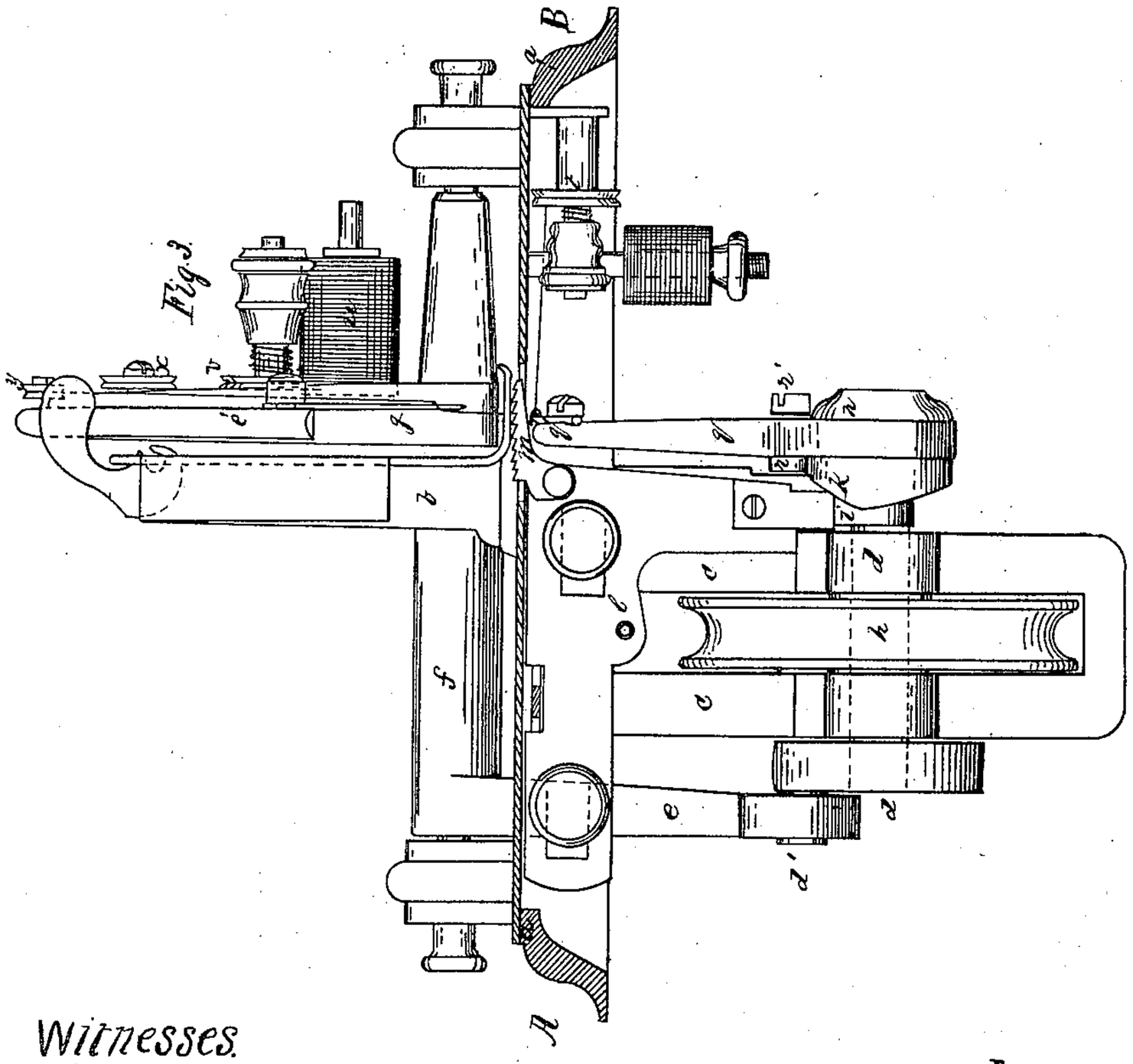

Witnesses.
James B. Wade
Lewis H. Brown.

Inventor.
W. O. Grover

UNITED STATES PATENT OFFICE.

WM. O. GROVER, OF WEST ROXBURY, MASSACHUSETTS.

IMPROVEMENT IN SEWING-MACHINES.

Specification forming part of Letters Patent No. **36,405**, dated September 9, 1862.

To all whom it may concern:

Be it known that I, WILLIAM O. GROVER, of West Roxbury, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Sewing-Machines; and I do hereby declare that the following, taken in connection with the drawings, is a full, clear, and exact description thereof.

In the drawings, Figure 1 is a side elevation of the machine with certain portions of the platform or bed-plate removed to show the working parts. Fig. 2 is a similar side elevation with the working parts in a different position. Fig. 3 is a front elevation with parts of the platform removed. Figs. 4 and 5 are side elevations, in detail, of the needle, the thread-carrier, and the assistant looper. Figs. 6 and 9 are elevations of the needle and assistant looper. Figs. 7 and 8 are plans of the assistant looper and thread-carrier. Fig. 10 is a detail view, partly in section and partly in elevation, of the main shaft, thread-carrier stock, and apparatus for moving the same; and Fig. 11 is an elevation of the thread carrier stock, the crank-pin and sleeve being shown in section.

My first improvements are applicable only to machines making what is commonly termed the "Grover & Baker" or double-thread looped stitch; and it consists in certain mechanism for actuating the thread-carrier, and in combining the same with an assistant looper.

My second improvement was designed especially for use in such machines, but is applicable also to other varieties of sewing-machines; and it consists in certain apparatus for governing the upper thread in its passage from the bobbin to the needle.

In this specification I mean by the term "thread-carrier" an instrument, with an eye near its end, that controls the lower thread, passing bights of it through loops of the upper thread, and holding loops of its own thread in position to be entered by the needle. This instrument is often called the "lower needle," as it is shaped somewhat like an ordinary eye-pointed needle.

I shall call in this description that side of the machine marked A the left, and that marked B the right, side of the machine; and I shall call the end of the machine nearest the needle the front, and the end nearest the rock-shaft the rear, of the machine.

All parts of the machine are mounted on a platform or bed-plate, *a*, whose upper surface supports the material to be sewed. Attached to the upper part of this bed-plate is an arm or bracket, *b*, in the front end of which is supported an ordinary presser-foot, slide, and spring, and from the lower side of the bed-plate descend two hangers, *c c*, in which, in proper boxes, is mounted the main shaft *d*. At one end of this shaft is a crank-pin, *d'*, taking into a slot in an arm, *e*, which makes a part of or is secured to a rock-shaft, *f*, and from this rock-shaft projects the needle-arm *e'*. The rock-shaft is pivoted, and rocks upon two pins in a manner well known in sewing-machines, and when the main shaft *d* is worked the needle-arm will oscillate, causing the needle *g*, attached thereto, to rise above and descend below material lying on the bed-plate

On the main shaft is keyed a driving-pulley, *h*, and it also carries two cams, *i k*, which, aided by a spring, *l*, give proper motions to an ordinary four-motion feeding-surface, *m*. The hub, out of which the cam *k* is cut, is, on the side nearest the right side of the machine, formed into a surface whose periphery lies in a plane slightly out of perpendicular to a line passing through the center of the main shaft. A piece of metal, *n*, from which projects a sleeve, *o*, is then secured with its flat side parallel to the surface last named by a pin or screw, *p*, and between this flat side and the surface is clamped the thread-carrier stock *q*, to one end of which is secured the thread-carrier *q'*. This stock is slotted, as clearly shown in the drawings, especially in Fig. 11, the sleeve passing through the slot. It is also drilled through just above the slot, and into this hole is slipped a loose sleeve, *r*, rounded or spheroidal on its periphery and bored out cylindrically. This sleeve is free to slide on a stationary pin, *r'*, and the stock *q* can rock over the periphery of the sleeve, this pin and sleeve forming a pivot, on which the stock oscillates. When the main shaft revolves the surface on *n* and the pin *p* and sleeve *o* revolve with it; and as the sleeve *r* and pin *r'* form a pivot or center of vibration for the thread-carrier stock, the revolution of the sleeve *o* will cause the thread-carrier to vibrate from front to rear of the machine, and

vice versa. As this stock is confined against a revolving plane out of perpendicular to the center line of the main shaft, the revolutions of that shaft will cause the thread-carrier to vibrate from right to left, and vice versa; and during such vibrations the stock will rock in the sleeve *r*, and this latter will slide on the pin *r'*. In order to give these motions to the stock with mathematical precision, the sleeve *r* should be on its periphery a portion of a perfect sphere, and this sphere should be confined in the stock as a cap and ball-joint, and I intend sometimes to use such a construction; but that shown in the drawings is sufficient for practical purposes, and cheaper.

The thread-carrier must vibrate from front to rear sufficiently far to seize, hold, and release loops of upper or needle thread as usual, and must vibrate sidewise to a distance equal to its own width and the diameter of the needle.

Any clamp or clamps may be substituted for the piece *n* so long as they permit the shaft to revolve and the stock to move from front to rear and cause the stock to be held firmly against the inclined surface, and an ordinary pin without a sleeve may revolve with the shaft and enter the slot in the stock, or the stock may receive its front and rearward motion from some other instrumentality, while its sidewise motions are caused by the inclined revolving plane surface. When the shaft is revolved and thread supplied in any ordinary way to the needle and thread-carrier, and cloth or other suitable material is placed upon the table, the needle will descend to its lowest limit, as in Fig. 2, will rise a little to open a loop, and the thread-carrier, advancing on the left side of the needle, will enter the loop. (See Figs. 4 and 7.) The needle then rises to its full extent, and after leaving the cloth and before it enters it again the cloth is fed and the thread-carrier has advanced to its full extent toward the rear of the machine and has retreated again, and while so doing has moved sidewise to the right, so as to be on the right side of the descending needle. As the needle continues to descend all parts arrive at the position shown in Figs. 5 and 8, and the needle enters between a loop of its own thread, a portion of lower thread, and the thread-carrier, as clearly shown in Figs. 5 and 8. The needle continues then to descend and the thread-carrier to retreat till the positions shown in Fig. 2 are again reached, and before the parts reach the position shown in Fig. 4 the thread-carrier has moved over to the left, so as to be and pass on the left side of the needle.

Now, there is nothing new in a thread-carrier moving in four directions—advancing, retreating, to the right, and to the left—but the mechanism by which those motions are imparted to the needle is new.

In order to assist the thread-carrier in carrying that portion of its own thread which leads from its eye to the cloth out of the way of the needle, I use in combination with it what I have termed an "assistant looper," S. The acting part of this instrument is a small stationary surface lying in line, or nearly so, with the left side of the needle and to the rear of it. This surface projects below the lower side of the platform, and when the thread-carrier is advanced to its utmost limit (see Fig. 1) lower thread leads from the hole in the table through which the needle passes to the eye of the thread-carrier, and in so doing leads along the left side of the acting surface of the assistant looper S. When the thread-carrier retreats thread is pulled through its eye by an ordinary vibrating spring lying between the lower tension apparatus, *t*, and the carrier, and as the thread-carrier moves over to the right the thread hangs on the surface of the assistant looper by friction and a part of the lower thread is kept more completely out of the path of the upper needle than it would be if it led directly from the cloth to the eye of the carrier. This action takes place for the reason that the assistant looper forces the lower thread first to lead from the cloth rearward and downward to its surface, and then rearward, sidewise, and downward to the eye of the thread-carrier. This portion of lower thread is thus bent into a sort of bow, and the needle enters between this bow and the thread-carrier. When the stitch is a long one, as represented in Fig. 8, the assistant looper performs little or no duty; but when the stitches are short it acts very successfully, but even then it is not absolutely necessary, although it makes the machine more perfect and prevents missing of stitches. As before stated, this assistant looper and the mechanism for actuating the thread-carrier are useful only in machines making a Grover & Baker stitch.

My other improvement is chiefly applicable to sewing-machines of that class, but is useful in other varieties of sewing-machines; and this improvement has for its object the keeping of an equal tension on the thread, even when the length of stitches is suddenly altered or a sudden jump is made from thin to thick material, or from one thickness to a number of thicknesses of cloth or other goods. This contrivance consists essentially of two tension apparatus or frictions applied to the needle-thread, the one weaker than the other, and stationary, and the other stronger and reciprocating, the two acting in connection with an eye or leader on the needle-arm, and the latter moving in such manner that the stationary friction apparatus prevents thread from falling slackly in the way of the needle-point as the latter penetrates the cloth, while at the same time slack thread is formed by the approach of the moving toward the stationary tension.

In the drawings the bobbin holding thread for supply of the needle is shown at *u*. It is mounted loosely on a spindle, and from it the thread is led through a reciprocating friction apparatus, *v*, mounted on a prolongation, *w*, of the needle-arm *e'*, which extends rearward

from the rock-shaft. The thread is next led through a stationary friction apparatus or thread-drag, *x*, mounted on any convenient standard attached to the bed-plate, and thence passes through a third friction contrivance or drag, *y*, near the end of the needle-arm. These tension or friction contrivances or thread-drags are, as represented in the drawings, composed of disks mounted on a spindle and pressed together by a spring. These disks are concaved on their adjacent sides, except at the edges, where they are beveled away from each other, or convex. When thread is passed between them it is nipped and has a drag put on it, and a turn may be taken around the spindle on which the disks are supported. I intend to adjust the pressure of the spring on the reciprocating tension by a screw-nut, (see Fig. 3,) and the springs on the other drags need no adjustability, although they may have it.

By looking at Figs. 2 and 3 it will be perceived that the drag *x* is so mounted in relation to the drag *y* and the needle-arm pivot is in such relation to the two that the distance between *x* and *y* it increases as the needle descends, and the distance between *v* and *x* decreases during the same time. The tension apparatus *y* is a very light one. Its sole purpose as a tension apparatus is to lift up thread on one side of the needle as the latter ascends while still below the cloth, and thus prevent formation of a loop on that side of the needle opposite to that on which the thread-carrier enters. Its other office is that of an eye or leader for the thread, and any eye or pin serving as a leading-block may in some cases be substituted for it.

As before stated, the amount of friction imposed upon the thread by *x* is less considerable than that imposed by *v*. The sum of both is equal to that imposed by one tension when only one is used, as is ordinarily the case.

In the action of the machine, as the needle rises to the position Fig. 1 it takes thread off of the spool against the drag of all the tensions, and as it descends it takes thread from *x*; but as *v* approaches *x* faster than *y* recedes from *x*, it follows that slack thread will form between *v* and *x*. (See Fig. 2.) When the loop of upper-needle thread is released by the thread-carrier backing out of it the tension imposed by *x* will be sufficient to draw that loop up to the cloth as the needle descends, and if a long stitch is taken, or the needle passes suddenly through a thicker material, the extra thread required will be taken from the slack between *x* and *v*, and the drawing out of this thread is retarded by the friction on *x* only, instead of by the whole drag on the thread. It therefore follows that thread will never be stretched so as to spring back and prevent the formation of a loop when the needle ascends, and it also follows that the thread will be less liable to abrasion in the eye of the needle; and these effects follow from the combination of a reciprocating and a stationary tension and an eye or leader acting as described.

I have described the stationary drag as imposing less tension on the thread than the moving one, and it is best so to adjust them; but the tension of the movable may be as great or greater than that imposed by the stationary and the same beneficial results follow, but the action will less perfect.

Any proper or known instrumentalities for producing a drag or tension upon thread may be substituted for those described, provided they are mounted relatively to each other and act substantially as described, and the spool itself may be mounted where *v* is and have a friction or drag applied to it, and the same results will be produced. This contrivance effects the same results as a contrivance lately patented by me, but does so without the aid of a vibrating tension-spring.

I claim as of my own invention—

1. Giving a vibrating motion to a thread-carrier in directions perpendicular to its advancing and retreating motions, or nearly so, by means of a revolving surface inclined to a revolving shaft, the thread-carrier stock being forced against that surface, and the contrivance acting substantially as specified,

2. Giving four motions to a thread-carrier by means of an inclined revolving surface, a pin or sleeve, and a pivot, the whole either acting on the stock or controlling its motions, substantially as specified.

3. In combination with a thread-carrier having four motions, a stationary assistant looper, substantially such as described, the two acting in combination, substantially in the manner set forth.

4. In combination, a vibrating thread-tension, a stationary thread-tension, and an eye or leader on a needle-arm, when the three are relatively arranged and act in combination, substantially as described, for the purposes specified.

In testimony whereof I have hereunto subscribed my name.

W. O. GROVER.

In presence of—
JAMES C. WADE,
JAMES H. BROWN.